



# Idaho Power

## RAPID RIVER HATCHERY

1986 Chinook Brood Year Report



by

Tom Levendofsky, Hatchery Superintendent III  
Joe Chapman, Fish Hatchery Superintendent I  
Ralph Steiner, Fish Culturist

February 1989

## TABLE OF CONTENTS

	<u>Page</u>
ABSTRACT .....	1
INTRODUCTION .....	2
LOCATION .....	2
OBJECTIVES .....	2
FISH REARING FACILITIES .....	2
WATER SUPPLY .....	3
STAFFING .....	4
FISH PRODUCTION .....	4
Adult Collection .....	4
Inventory of Miscellaneous Species .....	6
Holding and Spawning .....	6
Incubation .....	7
Early Rearing .....	8
Final Rearing .....	8
FISH HEALTH .....	10
FISH DISTRIBUTION .....	14
Fish Marking .....	14
Fingerling Release .....	16
Smolt Release .....	16
FEED USE .....	16
FEED EXPERIMENT .....	16
RECOMMENDATIONS .....	18
Facility Improvements .....	18
ACKNOWLEDGEMENTS .....	19
LITERATURE CITED .....	19
APPENDICES .....	20

## LIST OF TABLES

	<u>Page</u>
Table 1. Carrying capacity of all systems at Rapid River Hatchery .....	3
Table 2. Comparison of observed and suggested water parameters.	4
Table 3. Fish collection incidental to spring chinook .....	6
Table 4. Total egg take and distribution, Rapid River fish, 1986 .....	7
Table 5. Survival by life stages of chinook salmon at Rapid River for brood year 1986 .....	8
Table 6. Initial pond loading densities, June, 1986 .....	10
Table 7. Summary of marked fish releases from Rapid River, 1987	14

## LIST OF FIGURES

Figure 1. Timing of adult returns, 1986 .....	5
Figure 2. Length frequency of adult returns .....	9
Figure 3. Observed and projected growth during early rearing...	11
Figure 4. Observed and projected growth during final rearing .....	12
Figure 5. Percent monthly mortality of BY 1986 fish .....	13
Figure 6. Average monthly water temperature at Rapid River Hatchery, 1975-1987 .....	15
Figure 7. BY 1986 feed experiment monthly mortality (x).....	17

## LIST OF APPENDICES

	<u>Page</u>
Appendix I. Returns of spring chinook to Rapid River Hatchery, survival to spawning, and enumeration of eggs, 1964-1986 .....	21
Appendix II. Summary of spring chinook returns to Rapid River by brood year .....	22
Appendix III. Summary of fingerling releases from Rapid River, brood year 1986 .....	23
Appendix IV. Breakdown of feed purchased at Rapid River during brood year 1986 .....	23
Appendix V. Length frequencies of returning adults (1986) .....	24
Appendix VI. Length frequency data on returning adult chinook (1986) .....	25

## ABSTRACT

Operation of the adult trap began on April 14 and continued through September 12, 1986. Between May 13 and July 13, a total of 6,723 spring chinook were collected. This total was comprised of 6,546 adults and 177 jacks. Sex ratio of adult fish was 44.46% male and 55.54% female.

Prespawning mortality for Rapid River fish in 1986 was 34.03%. Autopsies performed on these fish revealed only 1.492 having signs of bacterial kidney disease (BKD). Spawning operations began on August 18 and continued through September 8, 1986. A total of 2,451 females were spawned, yielding approximately 10,673,138 eggs, of which over 3 million were transferred to other projects. Survival to eye-up and swim-up was 63.85% and 90.31%, respectively.

A total of 649,000 fingerlings were planted into the Clearwater and Salmon River drainages, and 238,900 were transferred to Red River Pond for final rearing.

Prior to smolt release, 318,684 fish received coded wire tags and 125,294 fish were freeze branded for research purposes. A total of 3,030,800 smolts were released from Rapid River Hatchery in 1988, with 2,630,200 being released directly into Rapid River and 400,600 released into the Snake River below Hells Canyon Dam.

A total of 251,700 pounds (114,201.5 kg) of feed was used to produce 160,179 pounds (72,676.5 kg) of fish, for an overall feed conversion of 1.57:1. Total feed cost for the 1986 brood year was \$102,801.62.

### Authors:

Tom Levendofsky, Hatchery Superintendent III  
Joe Chapman, Hatchery Superintendent I  
Ralph Steiner, Fish Culturist

## INTRODUCTION

Rapid River Hatchery was constructed in 1964 by Idaho Power Company as compensation for losses of chinook salmon (*Oncorhynchus tshawytscha*) resulting from the construction of Brownlee, Oxbow and Hells Canyon dams on the Snake River. This mitigation, as required by the Federal Energy Regulatory Commission, required that Idaho Power transplant this run of chinook from the Snake River to the Salmon River drainage and provide funds for the production of 3 million spring chinook smolts annually. These fish are for release into Rapid River and the Snake River below Hells Canyon Dam.

## LOCATION

Rapid River Hatchery is located in Idaho County approximately seven miles (11.2 km) southwest of the community of Riggins, Idaho, on Rapid River, a tributary to the Little Salmon River. Rapid River Hatchery is staffed and operated by the Idaho Department of Fish and Game (IDFG) and completely funded by Idaho Power Company.

## OBJECTIVES

The objectives of Rapid River Hatchery are:

1. To produce 3 million spring chinook smolts at an average size of 15 to 20 per pound (33.1 to 44.1 per kg) for release into Rapid River and the Snake River below Hells Canyon Dam.
2. To trap and spawn adult salmon returning to Rapid River.
3. To evaluate various strategies and techniques for rearing spring chinook salmon.
4. To collect eggs in excess of hatchery needs for distribution to other projects statewide.

## FISH REARING FACILITIES

The fish rearing facilities at Rapid River Hatchery consist of 48 double-stack Heath incubator trays, 12 outdoor concrete raceways (6 ft. x 90 ft.; 1.82 m x 27.3 m) and 2 earthen rearing ponds. One concrete adult holding pond (80 ft. x 25 ft.; 24.3 m x 7.6 m) and two earthen holding ponds provide space for holding up to 9,000 adult salmon for spawning. Capacities for each of these containers are presented in Table 1.

Table 1. Carrying capacity of all systems at Rapid River Hatchery.

Container	Volume	Carrying capacity
Heath Incubators	768 Trays	7.7 million eggs
Raceway 1	1,890 ft. <sup>3</sup> ea.	430,000 fry ea.
Rearing Pond 1	64,000 ft. <sup>3</sup>	1 million smolts
Rearing Pond 2	96,000 ft. <sup>3</sup>	2 million smolts
Holding Pond 1	8,000 ft. <sup>3</sup>	1,000 adults
Holding Pond 2	24,000 ft. <sup>3</sup>	3,000 adults
Holding Pond 3	35,000 ft. <sup>3</sup>	5,000 adults

The adult trapping facility, located on Rapid River approximately 1.5 miles (2.4 km) downstream from the hatchery, is equipped with a permanent wooden velocity barrier, a three-step fish ladder and a two-stage trap. Adult salmon are transferred from the trap to a 1,000-gallon tank truck for transport to the hatchery by means of an Alaska Steep Pass ladder and a 500-gallon bucket operated by an overhead hoist.

#### WATER SUPPLY

From its origin in Adams County, Rapid River flows through a pristine canyon before reaching the hatchery. Under inclusion in the Wild and Scenic Rivers Act, the Rapid River drainage has not been subjected to perturbations such as logging and roading and, consequently, provides an excellent water source for rearing chinook. Water quality analysis (Table 2) was conducted monthly by hatchery personnel and fell within the suggested range for optimal fish health as described by Piper et al. (1982).

Water for hatchery operation is obtained from Rapid River through one 30-in. (76.2 cm) and one 24-in. (61 cm) pipeline. A 5-ft. high (1.5 m), wooden diversion dam provides the necessary hydraulic head to supply the hatchery with approximately 30 cubic feet per second (cfs) of water. Except for the incubators, all systems operate on gravitational flow. Water for the incubation system is pumped from the headrace by one of two 7.5-hp electric pumps. A gasoline-operated pump and a filter bed system provide backup water should the electric pumps fail.

Table 2. Comparison of observed and suggested water quality parameters.

Parameter	Suggested range	Observed level
Alkalinity as CaCO <sub>3</sub>	10 - 400	85.0
Dissolved oxygen	5.0 - saturation	11.0
Ammonia (NH <sub>3</sub> )	<0.0125	0.005
pH	6.5 - 8.0	7.5
Total hardness as CaCO <sub>3</sub>	10 - 400	85.0

#### STAFFING

The permanent hatchery staff consists of a Hatchery Superintendent III, a Hatchery Superintendent I and a Fish Culturist. In addition to the permanent staff, approximately five seasonal employees are hired each year from February to November. The Summer Youth Employment Training Program (SYETP), administered by the Idaho Department of Employment, also provides one or two individuals to assist with grounds maintenance, etc. Housing accommodations include three residences for the permanent staff and a mobile home for seasonal employees.

#### FISH PRODUCTION

##### Adult Collection

Operation of the adult trap began on April 14 and continued through September 12, 1986. A total of 6,723 spring chinook (6,546 adults and 177 jacks) were collected between May 13 and July 13, with the peak of the run occurring June 16-23 (Figure 1). Sex ratio of adult fish was 44.5% (2,989) male and 55.5% (3,734) female.

Nearly 20% of the chinook collected this season were injured prior to arrival at the trap. While the majority (577 or 44%) of these injuries were gill net scars, a number of emboli (292 or 22%), apparently resulting from gas supersaturation and gaff wounds (155 or 12%), were also observed. Other injuries, such as hooking or fin abrasions, accounted for 301, or 23% of the total.

A total of 13 coded wire tags (CWT) were recovered from fish in 1986. These fish were part of the U.S./Canada agreement to determine Idaho's contribution to ocean harvest.

During 1986, an estimated 704 chinook salmon destined for Rapid River were harvested by sport fishermen on the Little Salmon River, and approximately 2,800 were harvested by the Nez Perce Tribe in Rapid River and the Little Salmon River.



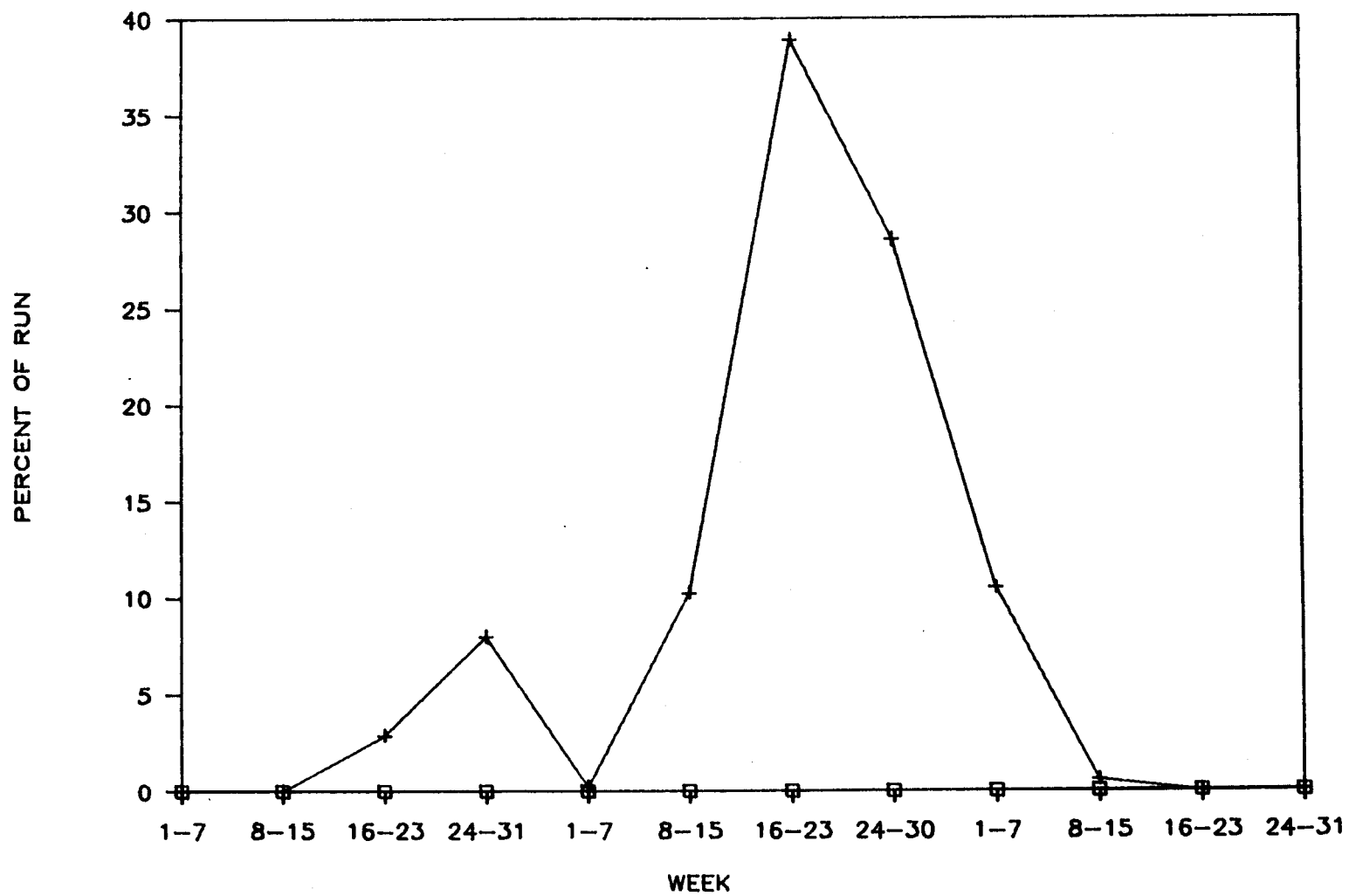


Figure 1. Timing of adult chinook returning to Rapid River trap (1986).

### Inventory of Miscellaneous Species

Other species trapped incidental to spring chinook include adult summer chinook, adult steelhead trout (Salmo gairdneri), bull trout (Salvelinus confluentus), rainbow trout (Salmo gairdneri) and whitefish (Prosopium williamsoni) (Table 3). All of these fish were returned to Rapid River.

Table 3. Fish collection incidental to spring chinook.

Species	Number trapped
summer chinook	715 adult, 48 jacks
steelhead	77
bull trout	137
rainbow	2
whitefish	1

### Holding and Spawning

To reduce prespawning mortality due to bacterial kidney disease (BKD), all fish were given a single subcutaneous injection of Erythromycin Phosphate (2.2 mg per kg body weight), and any injuries were treated with a direct application of a fungicide prior to transfer to the holding pond. To control fungal development and further reduce prespawning mortality, fish were treated with a fungicide three times per week throughout the holding period.

Prespawning mortality for Rapid River fish in 1986 was 34.03% (Appendix I). Autopsies performed on these fish revealed only 1.49% to have apparent signs of BKD, while 12.02% died from fungus-related problems. The remainder died from unknown causes.

Oxbow Hatchery transferred 351 adult spring chinook and 11 jacks to Rapid River during May and June that were trapped at Hells Canyon Dam. Because of the relatively small number of fish received, they were mixed with Rapid River fish and included in the final spawning totals.

Spawning operations began on August 18 and continued through September 8, 1986. Eggs were taken dry and ovarian fluid removed to reduce the potential for vertical disease transmission. Sperm was also collected dry and pooled prior to fertilization. A total of 2,451 females were spawned, yielding approximately 10,673,138 eggs. Average fecundity was 4,355 eggs per female. All eggs were water hardened in a 100-ppm solution of buffered Argentyne for one-half hour before transfer to the incubators.

Due to the large run again this year, eggs were available for distribution to other projects. Total egg take and distribution figures are presented in Table 4.

Table 4. Total egg take and distribution, Rapid River fish, 1986.

Receiving agency	Number females	Number green eggs
Dworshak	638	2,368,400
Sawtooth	156	712,905
Rapid River	1,657	7,591,833
TOTAL	2,451	10,673,138

With the exception of approximately 500 carcasses which were buried in a pit near the hatchery, all unsalvageable carcasses were frozen and shipped to Idaho Animal Byproducts Company of Nampa, Idaho. A total of 87 salvageable chinook carcasses were dressed, frozen and given to various food banks and the general public.

#### Incubation

After water hardening in Argentyne, eggs were sized using a 6-in. (15.24 cm) VonBayer trough and placed in Heath incubator trays. Loading density was approximately 80 fluid ounces (2,365.6 ml) per tray.

Beginning on the fourth day of incubation, all egg lots were treated with formalin to control fungal invasion. Treatments were administered three times per week at a 1:600 concentration for 15 minutes and continued until each lot accumulated 800 daily temperature units (TU).

Eye-up occurred at approximately 500 TUs, at which time all eggs were shocked and picked using the salt flotation method. Egg size was redetermined at this time using volumetric displacement, and the eggs were returned to the incubator trays. Survival to eye-up ranged from 61.5% to 88.4%, with an overall average of 63.9%. Hatching occurred at approximately 1,000 TUs, and swim-up fry were transferred to the raceways at 1,698 to 1,834 TUs. Survival from eye-up to swim-up averaged 90.31% (Table 5).

Table 5. Survival by life stages of chinook salmon at Rapid River for brood year 1986.

	Eggs taken	Eye-up	Moved to raceways	Moved to ponds	Number released
Numbers	7,591,833	4,672,267	4,219,672	3,212,582	3,030,800
% loss	0	38.46	9.69	2.82 <sup>a</sup>	5.66
Cumulative loss	0	38.46	44.42	45.99 <sup>a</sup>	48.38

<sup>a</sup>887,900 fingerlings were outplanted.

### Early Rearing

During the period January 13 through February 17, 1987, a total of 4,219,672 swim-up fry were transferred to the raceways. Average size at the time of transfer was 1,300 per pound (2,865 kg). Loading densities ranged from 342,844 to 409,085 fish per raceway, with an initial water depth of 1.5 ft. (.46 m) and inflow of 0.9 cfs. As fish size increased, water depth and inflow were adjusted up to a maximum of 3 ft. (.91 m) and 1.5 cfs flow to maintain density and flow indices at or below 0.5 and 1.5, respectively, as suggested by Piper et al. (1982).

All fish were initially fed Oregon Moist Pellet, Formula IV diet (OMP-IV) during the early rearing period, except for an experimental group being fed BioProducts. This group started on Oregon Moist and was switched to BioProducts on April 17, then continued on BioProducts until release (see Feed Experiment). Feed was delivered using Allen automatic feeders, with supplemental hand feeding done on an hourly basis. Fry were started on OMP starter mash at 1.5% body weight, with feed size increasing to 1/32 in. at 800 per pound counts were taken at two-week intervals and feed amounts adjusted accordingly. Growth rates during this phase of rearing were better than projected rates (Figure 2), and the mortality rate was only 2.16%.

### Final Rearing

By May 22, the transfer of fry to the earthen rearing ponds was completed. Mean size at this time was 274.11 fish per pound (604.13 kg). Initial pond loadings are presented in Table 6.

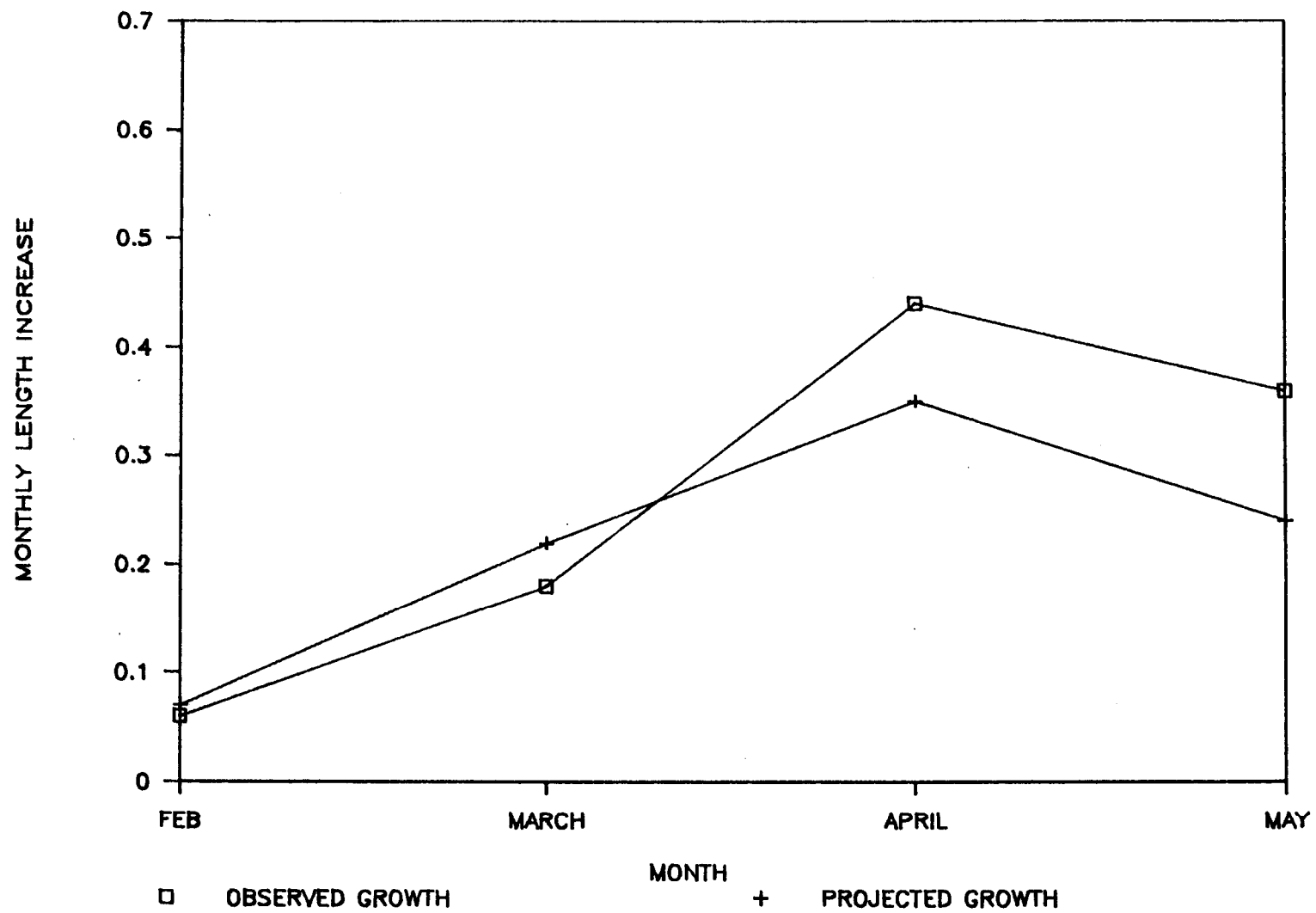


Figure 2. Observed and projected growth during early rearing.

Table 6. Initial pond loading densities, June, 1986.

Pond	Inflow	Millions of fish	Size per pound	Flow index	Density index
1	13 cfs	1.2	294.6	.32	.03
2A	7 cfs	0.6	247.5	.34	.04
2B	7 cfs	0.4	267.9	.21	.02
2C	7 cfs	0.4	279.5	.21	.02
2D	7 cfs	0.6	266.9	.32	.04

Except for the experimental group (see Feed Experiment section), all fish were fed OMP Formula II during the final rearing period. Initially, 1/16 in. pellet size was used, with feed size increasing to 3/32 in. at 150 per pound and 1/8 in. at 50 per pound. Feed rates ranged from 1.4 to 3.0% body weight. This year, feeding rates remained higher than normal to try and eliminate peduncle disease. Pound counts were taken on two-week intervals and feed volumes adjusted accordingly. As water temperature decreased in September, feed rates were reduced until a rate of less than 1.0% was fed during December and January.

By increasing the feeding rates during this period, it appeared to decrease peduncle disease, as mortality during this period (see Fish Health) was less than one-half the mortality during the same period last year. Fish growth was also higher than expected (Figure 3). Virtually no fish were lost to bacterial gill disease. Total mortality during this period was 5.7%.

#### FISH HEALTH

Fish health during the early rearing period was very good. The peak in mortality during March reflects the normal die-off of pinheads and initial moving stress (Figure 4). Routine necropsies conducted by hatchery personnel and IDFG pathology staff uncovered no significant abnormalities.

By May, mortality had dropped to 0.1% per month, where it remained through September (Figure 5). Although BKD was diagnosed during July in ponds 1 and 2D, the summer peak in mortality observed last year did not occur, and monthly mortality remained well below normal. Once again this year, reduced flows in September produced a decline in water quality. Routine necropsies showed hypertrophy and hyperplasia of gill tissue. In October mortality began to rise and hatchery personnel observed the beginning of our winter mycosis problem; however, less than 2% of the fish showed infestation. By November, large numbers of fish suffered Saprolegnia infestation and caudal necrosis. This was reflected in a peak in mortality, which accounted for one-third the total mortality to date.

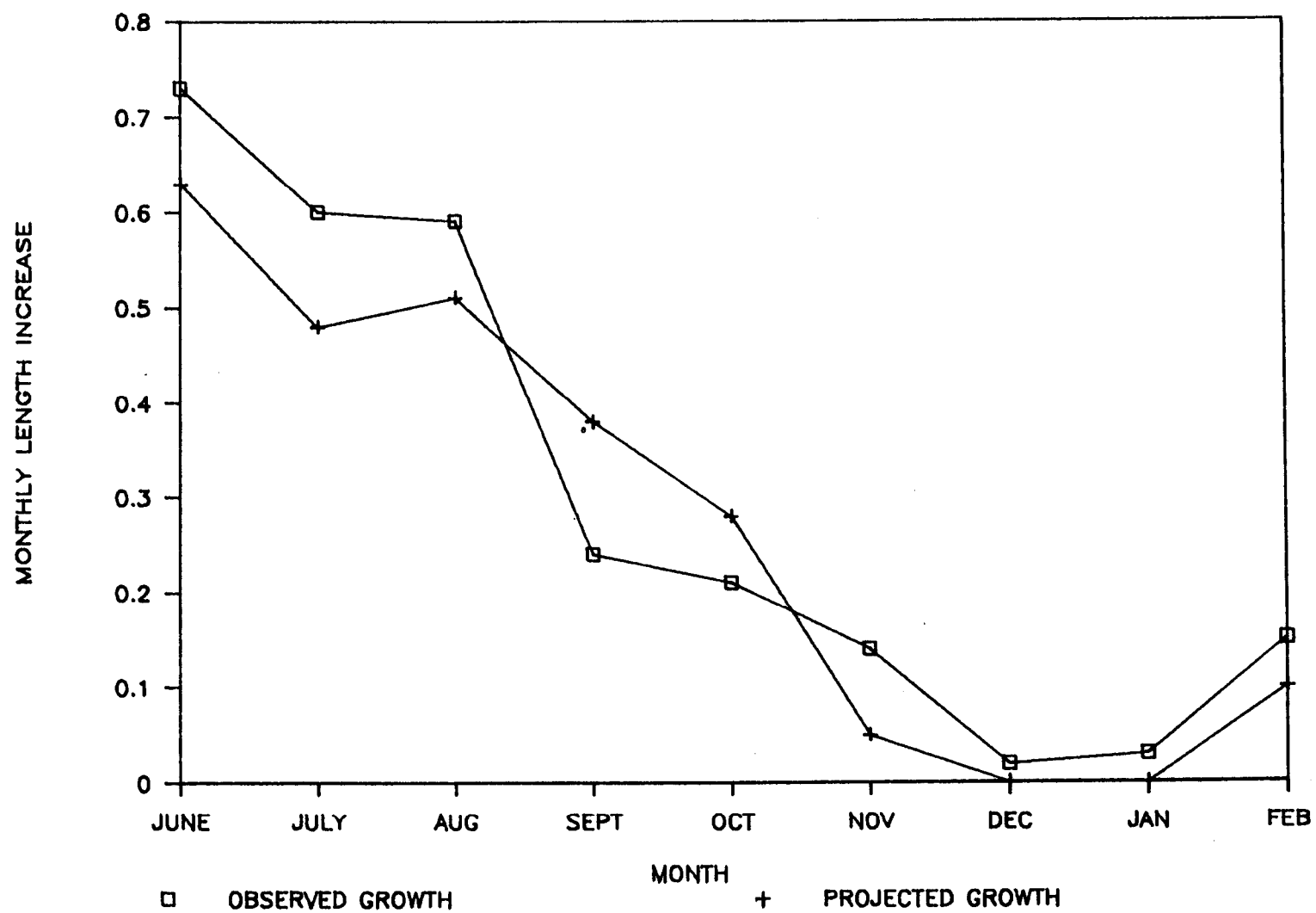


Figure 3. Observed and projected growth during final rearing.

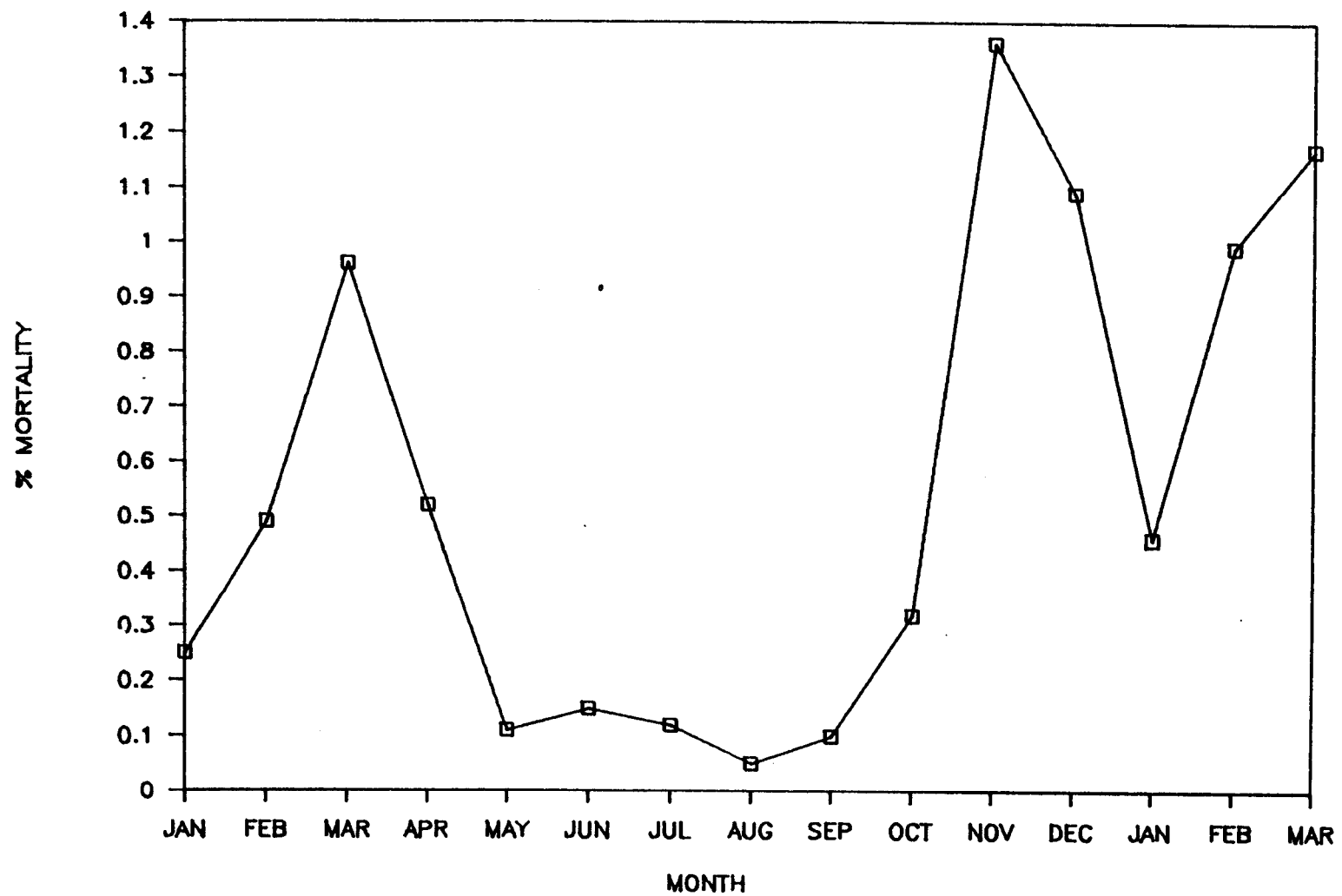


Figure 4. Percent monthly mortality of brood year 1986 fish.



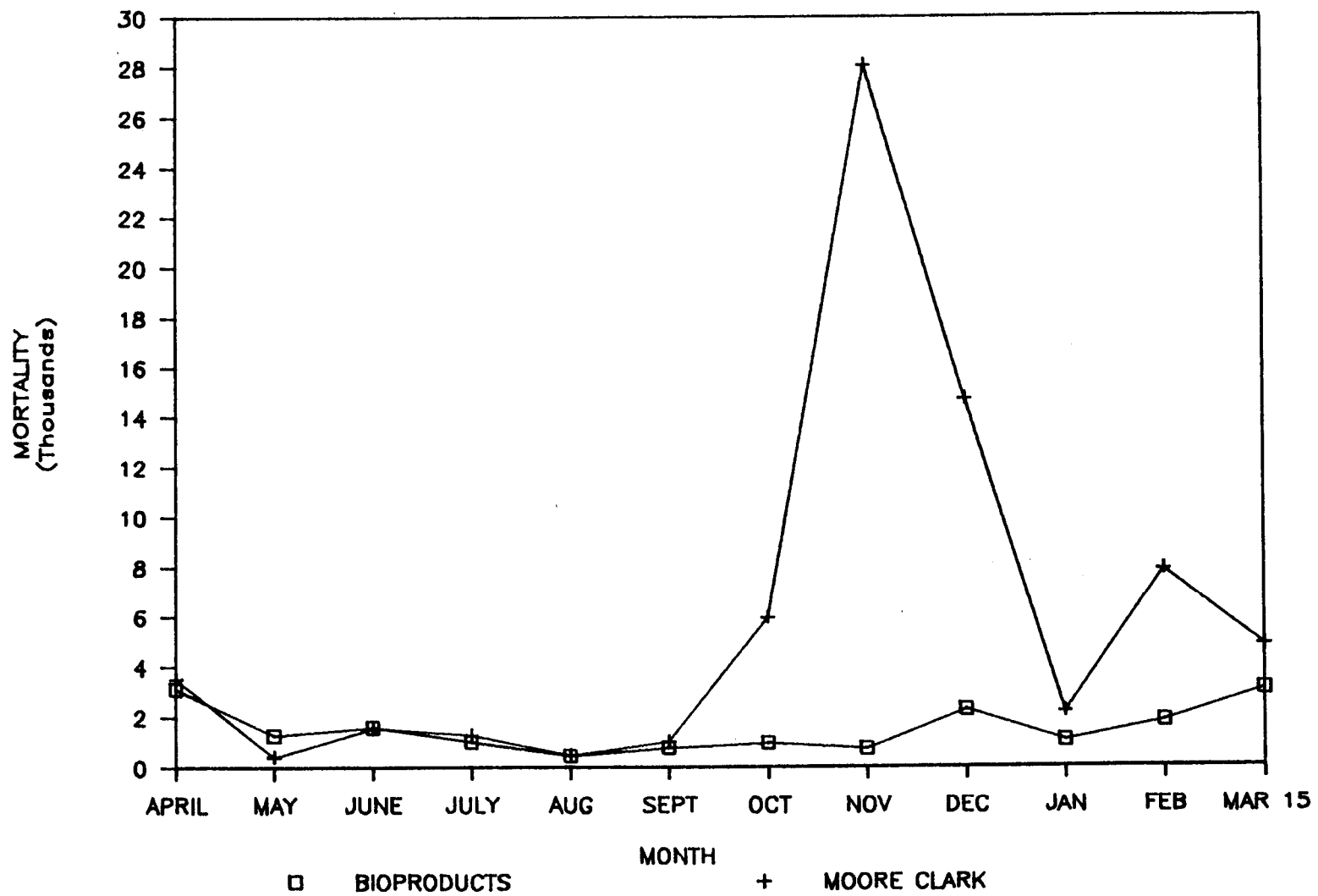


Figure 5. Percent monthly mortality by feed type.

The mortality rate throughout the remainder of the rearing period paralleled water temperature, declining through January, then rising through release in March (Figure 6). Total mortality during the last phase of the rearing cycle was 5.7%, less than one-half that of the previous year and the lowest in recent history.

Prior to release, smolts from all ponds were sampled for bacterial and viral pathogens and underwent smolt quality assessment. Test results were negative for IHN, IPN, and EIBS. Twenty percent of the sample tested for BKD were positive. Earlier testing for *M. cerebralis* was negative. Because of improved fish health, no treatments were administered to brood year 1986 fish.

## FISH DISTRIBUTION

### Fish Marking

In October of 1987, a portion of the 1986 brood year fish was marked in accordance with an agreement recently developed between the United States and Canada, in which selected stocks of Idaho fish will be used as indicators of Idaho's contribution to ocean harvest. Rapid River is one of these selected stocks, and a large group of fish received a CWT and an adipose fin clip for identification. In addition, two groups of fish were freeze branded for evaluation of outmigration timing and survival. These fish were placed in adult holding Pond 2 and the Pond 2 catch basin and released in conjunction with the normal hatchery production. A summary of marked groups is presented in Table 7.

Table 7. Summary of marked fish released from Rapid River, 1987.

Mark	Number marked	Size	Release group	Date released	Location
LDT-4	62,566	25/lb.	400,600	3/22 & 3/23/88	Snake R.
RDT-4	62,738 <sup>a</sup>	25/lb.	2,630,200	3/15 to 3/25/88	Rapid R.
CWT	318,684	25/lb.	2,630,200	3/15 to 3/25/88	Rapid R.

<sup>a</sup>These fish also received CWT.

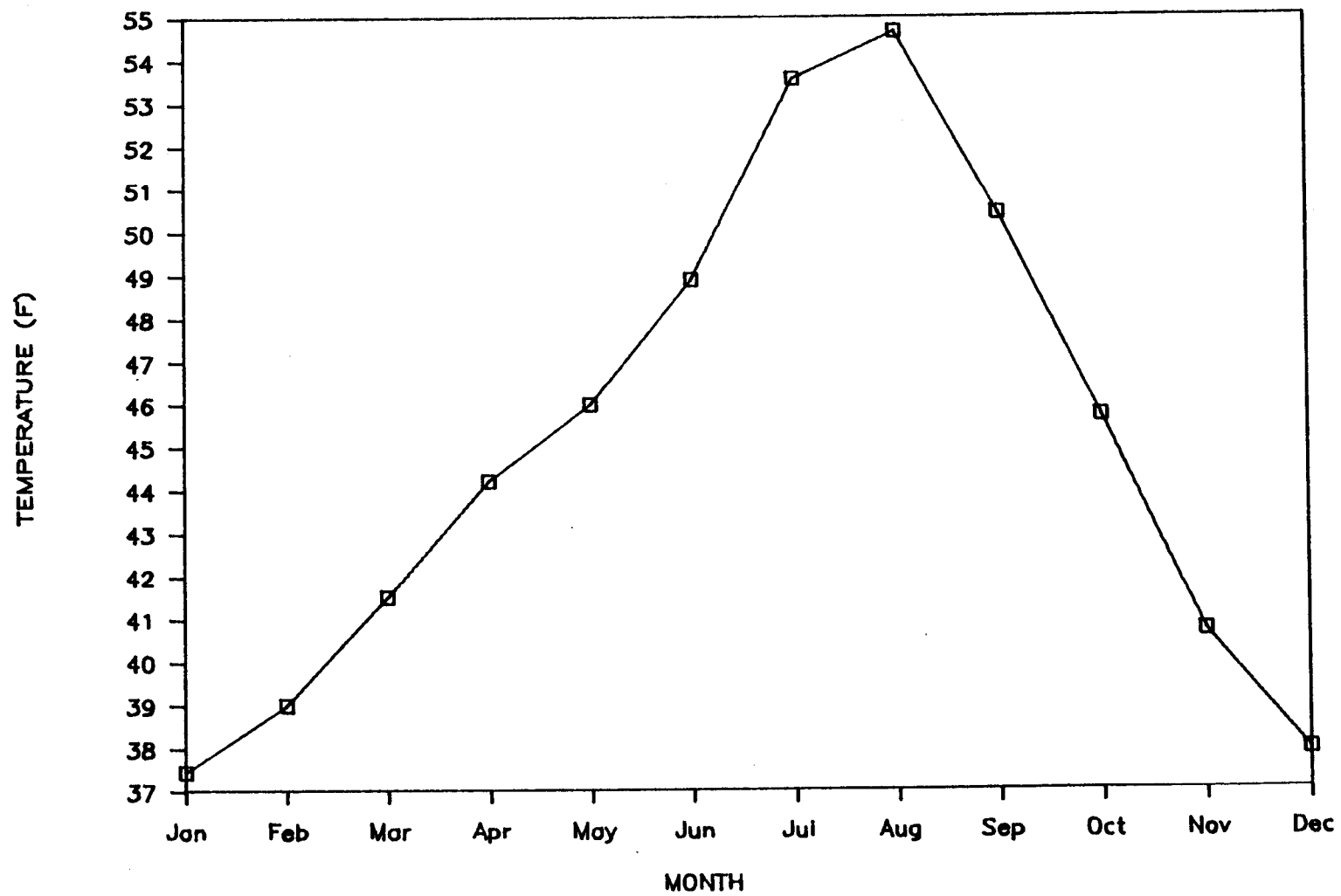


Figure 6. Average monthly water temperatures, 1975-1987.

### **Fingerling Release**

On May 7 and 8, 1987, a total of 649,000 brood year 1986 fingerling chinook were planted into the Clearwater and Salmon River drainages (Appendix III). These fish ranged in size from 115 to 468 fish per pound and were distributed by helicopter to the various streams. Another 238,900 fry were transported to Red River Pond for rearing and final release.

### **Smolt Release**

A total of 3,030,800 smolts were released from Rapid River Hatchery in 1988. This total includes 2,630,200 smolts released directly into Rapid River and 400,600 smolts released into the Snake River below Hells Canyon Dam. Smolts released directly into Rapid River averaged 19.16 per pound (42.2 kg) and 5.0 in. (127.0 mm) fork length, while smolts released into the Snake River averaged 19.84 per pound (43.7 kg) and 4.94 in. (125.5 mm) fork length.

### **FEED USE**

A total of 251,700 pounds (114,201.5 kg) of feed was used to produce 160,179 pounds (72,656.5 kg) of fish this brood year. This resulted in an overall feed conversion of 1.57:1. Total feed cost for production of 1986 brood smolts was \$102,801.62, or \$0.64 per pound (\$1.41 per kg) of fish produced.

### **FEED EXPERIMENT**

In April of 1987, a feed experiment was initiated to determine if the peduncle disease problem at Rapid River Hatchery could be attributed to feed brand. Approximately 2 million chinook fry were used in the 11-month experiment. Half were fed feed from Moore Clark Company, LaConner, Washington, while the remaining 1 million were fed feed from BioProducts Inc., Warrenton, Oregon. Both test groups were reared identically.

Results of this test indicate no significant difference in conversion, growth rate, or condition factor. However, mortality in the Moore Clark group was almost four times higher than the group fed BioProducts (Figure 6). Mortality among both groups was similar until October, when the Moore Clark group increased dramatically. This is the same time frame that this disease has been occurring in previous years. As Figure 7 indicates, mortality continued to climb through November. As water temperature decreased, mortality decreased, and then resumed again in February as water temperatures increased.

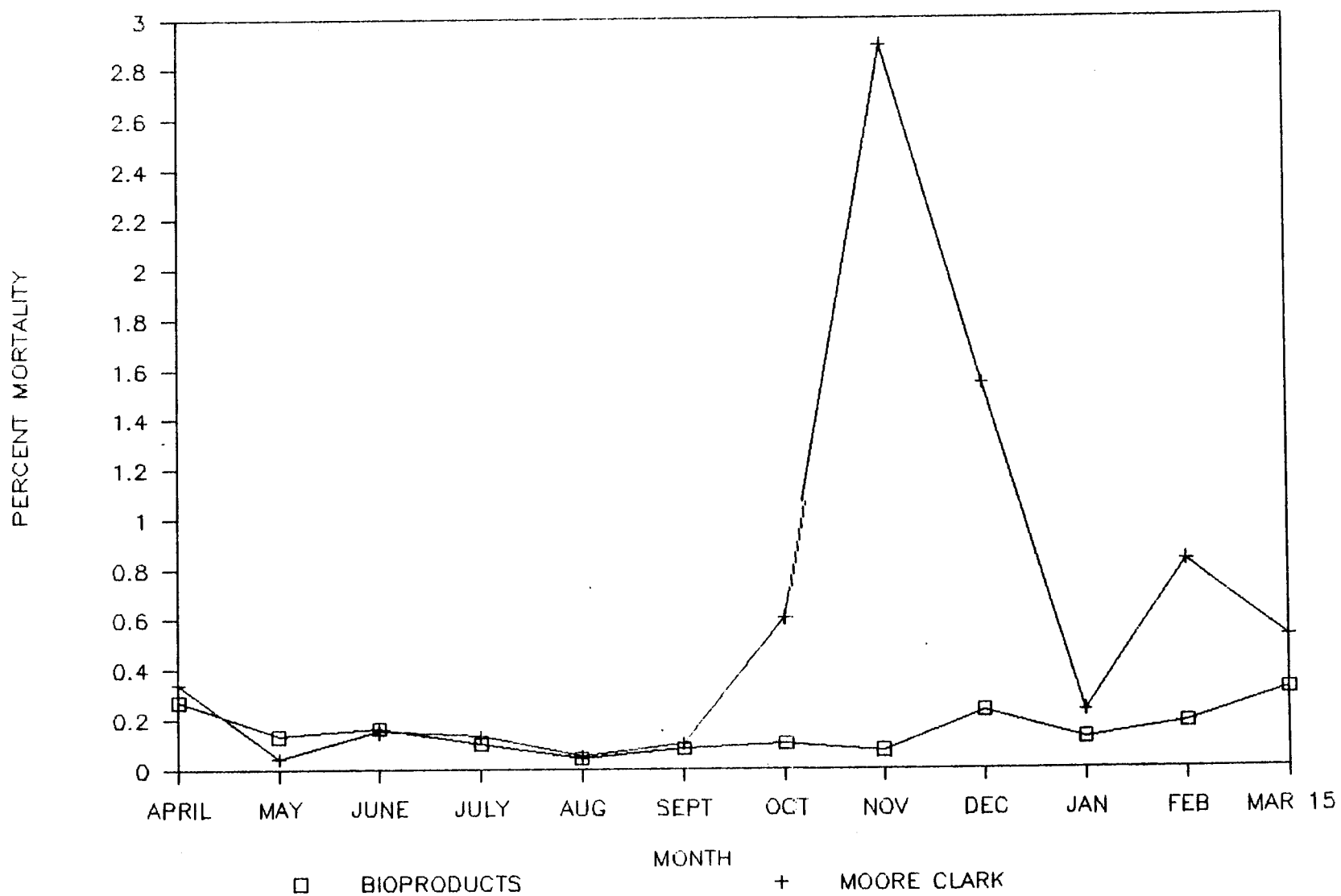


Figure 7. BY 1986 feed experiment monthly mortality (%).

It appears that this disease is indeed nutrition related. This experiment will be repeated again on the brood year 1987 fish to try to repeat this year's results. Hopefully, this disease problem can be eliminated at Rapid River in the foreseeable future.

## **RECOMMENDATIONS**

### **Facility Improvements**

Numerous improvements have been made in recent years to upgrade and improve hatchery operations. Consideration should be given to the following list of recommendations to further improve the overall operation of Rapid River Hatchery.

1. Reconstruct the adult holding and spawning facilities to include concrete holding ponds and mechanical crowders.
2. Resurface the roadway leading to Rapid River Hatchery and also the parking lot.
3. Install power-driven drum screens on the rearing pond outlets to facilitate leaf and algae removal.
4. Construct a visitor center and improve all hatchery signs.
5. Provide additional shrubs and ground cover in the hatchery park.
6. Construct a new sewage treatment system.
7. Construct a sand/silt settling basin for water intake system.
8. Reconstruct the water intake system at the trap facility.
9. Reconstruct piping, etc., for improved effluent settling.
10. Replace all raceway feeders.
11. Modify the smolt collection basin to facilitate smolt loading.
12. Design and install a fungus treatment system for adult chinook.
13. Construct baffleboards to improve fish health in raceways.
14. Modify water inlet system to Pond 1 to improve flow distribution.
15. Construct a leaf/debris skimmer at the hatchery water intake.
16. Improve wild fish movement around velocity barrier at the trap facility and at the hatchery headgate dam.

## **ACKNOWLEDGEMENTS**

The crew at Rapid River Hatchery would like to express their appreciation to Mr. Larry Wimer and the entire staff of Idaho Power Company for their continued support and assistance. The crew would also like to thank the coded wire tagging crew and enforcement personnel from Region 2 who provided assistance throughout the year. We also appreciate the extra help from other hatcheries during the spawning season.

## **LITERATURE CITED**

Piper, R.G., I.B. McElwain, L.O. Orme, J.P. McCraren, L.G. Fowler, and J.R. Leonard. 1982. Fish hatchery management. USDI Fish and Wildlife Service, Washington, D.C.

Past annual reports from Rapid River Hatchery.

## APPENDICES



Appendix I. Returns of spring chinook salmon to Rapid River Hatchery, survival to spawning, and enumeration of eggs, 1964-1986.

Return year	Snake R. returns (adults)	Rapid R. returns (adults)	Rapid R. returns (jacks)	Prespawning mortality percentage	Number of females spawned	Number of eggs per female	Number of eggs taken
1964	349			16%	182	4,874	887,000
1965	408			21%	133	4,541	604,000
1966	1,511			18%	621	3,697	2,296,000
1967	974		1,039	11%	581	3,537	2,055,000
1968	351	3,416	740	2%	1,809	3,671	6,540,000
1969	672	2,817	1,043	8%	1,415	3,655	5,151,697
1970		6,470	887	10%	3,520	4,136	14,560,280
1971		3,357	1,754	19%	1,722	3,507	6,038,785
1972		12,310	943	15%	3,825	3,941	15,072,604
1973		17,054	286	37%	3,454	3,912	13,510,465
1974		3,457	538	27%	1,756	3,924	6,890,186
1975		4,428	573	7%	2,184	3,894	8,503,606
1976		6,342	1,765	15%	3,055	3,762	11,492,878
1977		7,767	437	11%	3,781	3,745	14,160,330
1978		5,735	34	21%	2,350	4,266	<b>10,026,888</b>
1979		3,054	350	31%	1,141	4,950	5,648,722
1980		1,528	432	30%	543	3,235	1,756,827
1981		3,087	176	7%	1,666	3,675	6,122,273
1982		3,646	30	11%	1,883	3,973	7,482,330
1983		1,864	94	15%	859	4,015	3,449,471
1984		1,705	651	7%	821	3,807	3,125,911
1985		6,376	351	8%	2,962	3,741	11,082,369*
1986		6,546	177	34%	2,451	4,355	10,673,138

\*Volumetric displacement method total = 11,535.461.

Appendix II. Summary of spring chinook adults to Rapid River by brood year.

Brood year	Year released	Number released	3-yr olds	Year returned	4-yr olds	Year returned	5-yr olds	Year returned	Total brood year return	% return from plant
1964	1966	588,000	1,039	1967	3,422	1968	197	1969	4,658	0.80
1965	1967	479,267	740	1968	2,620	1969	874	1970	4,234	0.89
1966	1968	1,460,150	1,043	1969	5,596	1970	364	1971	7,003	0.48
1967	1969	900,192	887	1970	2,992	1971	1,544	1972	5,416	0.60
1968	1970	3,172,000	1,754	1971	10,766	1972	4,403	1973	16,923	0.53
1969	1971	2,718,720	943	1972	12,654	1973	1,759	1974	15,356	0.56
1970	1972	2,809,200	285	1973	1,698	1974	386	1975	2,370	0.08
1971	1973	2,908,425	538	1974	4,206	1975	1,120	1976	5,864	0.20
1972	1974	2,707,917	573	1975	5,222	1976	634	1977	6,429	0.24
1973	1975	3,373,700	1,765	1976	7,110	1977	1,845	1978	10,720	0.32
1974	1976	3,358,940	437	1977	3,890	1978	2,413	1979	6,740	0.20
1975	1977	2,921,172	34	1978	598	1979	46	1980	678	0.02
1976	1978	2,413,678	350	1979	1,482	1980	146	1981	1,978	0.08
1977	1979	2,866,993	432	1980	3,068	1981	557	1982	4,057	0.14
1978	1980	2,604,823	176	1981	3,089	1982	1,026	1983	4,291	0.16
1979	1981	2,372,607	30	1982	838	1983	356	1984	1,224	0.05
1980	1982	1,473,733	94	1983	1,349	1984	199	1985	1,642	0.11
1981	1983	2,998,103	651	1984	6,177	1985	1,456	1986	8,284	0.28
1982	1984	3,246,197	351	1985	5,090	1986	1,155	1987	6,596	0.20
1983	1985	2,491,238	177	1986	2,442	1987		1988		
1984	1986	1,594,688	210	1987						
	1987	2,836,400								
	1988	2,630,200								

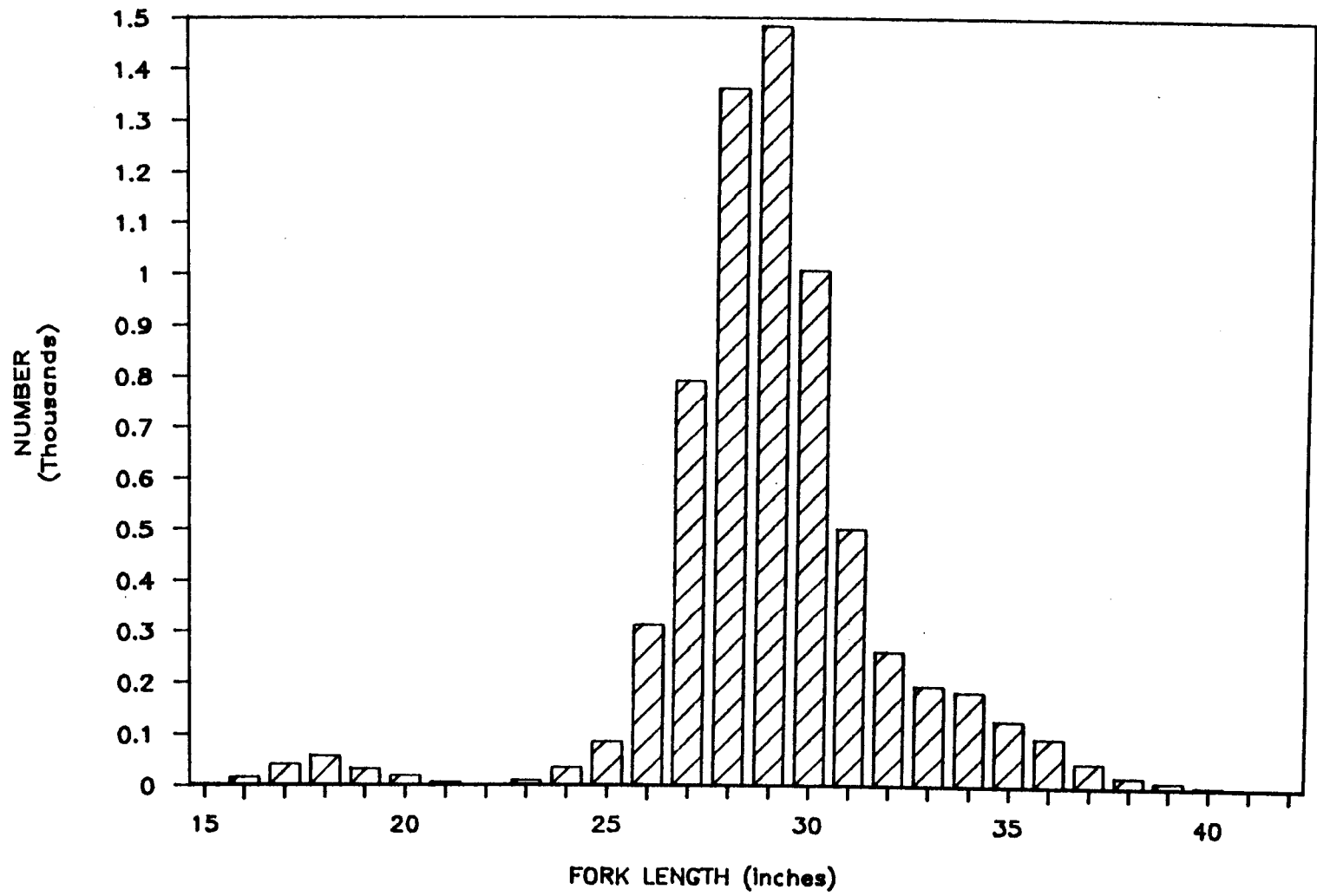
Appendix III. Summary of fingerling releases from Rapid River, brood year 1986.

Date	Stream	Number	Pounds	Fish/ pound
5/7/87	Crook Fork	58,000	148.86	395.00
5/7/87	Crook Fork	105,600	267.34	395.00
5/7/87	Crook Fork	185,000	468.35	395.00
5/8/87	White Sand Creek	152,400	351.20	434.00
5/8/87	Big Flat Creek	98,000	225.80	434.00
5/8/87	White Sand Creek	50,000	115.20	434.00
6/4/87	Red River Pond	238,900	1,157.46	206.40
Totals		887,900	2,734.21	324.74

Appendix IV. Breakdown of feed purchased at Rapid River during brood year 1986.

Feed size	Manufacturer	Cost/ pound	Pounds	Cost <sup>a</sup> (includes tax)
Starter	Moore Clark	0.46	700	338.10
1/32	Moore Clark	0.46	7,800	3,767.40
3/64	Moore Clark	0.46	6,500	3,139.50
1/16	Moore Clark	0.46	7,500	3,622.50
3/32	Moore Clark	0.38	36,500	14,659.31
1/8	Moore Clark	0.38	96,500	38,756.81
Totals			155,500	64,283.62
1.0 mm	BioProducts		660	363.83
1.3 mm	BioProducts		2,540	1,453.52
1.5 mm	BioProducts		6,300	3,472.88
2.5 mm	BioProducts		14,700	5,633.78
3.0 mm	BioProducts		72,000	27,594.00
Totals			96,200	38,518.00
Grand Total			251,700	102,801.62

<sup>a</sup>Cost/pound excludes tax.



Appendix V. Length frequencies of returning adults (1986).

Appendix VI. Length frequency data on returning adult chinook (1986).

Fork length (inches)	Number of fish
15	4
16	16
17	42
18	57
19	32
20	19
21	7
22	2
23	10
24	35
25	86
26	313
27	792
28	1,362
29	1,483
30	1,007
31	5,001
32	261
33	195
34	184
35	128
36	95
37	49
38	22
39	13
40	5
41	2
42	1

Submitted by:

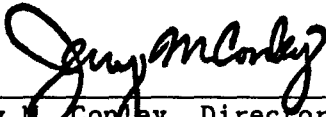
Tom Levendofske  
Hatchery Superintendent III

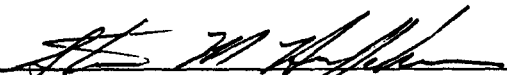
Joe Chapman  
Hatchery Superintendent I

Ralph Steiner  
Fish Culturist

Approved by:

IDAHO DEPARTMENT OF FISH AND GAME

  
Jerry M. Conley, Director

  
Steven M. Huffaker, Chief  
Bureau of Fisheries

  
Bill Hutchinson  
Anadromous Hatcheries Supervisor